

# EPA Tier 4 Update

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## Notice

- The following material represents an overview of regulatory requirements related to engine emissions for Electric Power applications
- The material is intended for general informational purposes only
- The information is NOT COMPREHENSIVE and DOES NOT address specific manufacturers' circumstances
- There is no substitute for reading and understanding the rules; companies are strongly encouraged to investigate and apply the regulations accordingly
- Regulations may change, and these materials may not be updated to reflect the latest regulatory revisions
- Companies relying on this information do so at their own risk and assume any liability for so doing
- The information IS NOT intended to be and should not be construed as legal advice or as a substitute for competent legal advice
- Please consult your legal advisor if you have questions or need assistance

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## Where are we now?

- Tier 4 Interim
  - Focuses primarily on PM reduction for engines ≤900 kW
    - Commenced in 2008 for engines <56 kW
    - Main impact is in 2011 /12 for engines ≥56 kW
    - Up to 90 % PM reduction & up to 50% NOx reduction vs Tier 3
    - 90% NOx reduction for gensets >900 kW
- Tier 4 Final
  - Focuses primarily on NOx reduction
    - Does not affect engines <19 kW
    - 2013 introduction for engines ≥19 <56 kW
    - Main impact is in 2014 / 15 for engines ≥56 kW
    - Up to 80% NOx reduction & further PM reductions (gensets ≥56 kW ≤560)
    - 70% PM reduction for gensets >900 kW

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### Emergency Engine Run Limits

Category	Yearly Limit	Exceptions
Emergency Service	No limits	None
Maintenance Checks and Readiness Testing	100 hours	If engine is >500 HP, at a major source and installed prior to 6/12/2006, no limit on maintenance testing
Non-emergencies	50 hours Counts as part of the 100 hr/yr maintenance limit Peak Shaving not allowed	None
Demand Response	15 hours in emergency situations (loss of utility)	Engines > 500 HP, at a major source, and installed prior to 6/12/2006 do not have the allowance for 15 hours of demand response

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- ### EPA Proposed Changes
- Allowance for Emergency Demand Response
    - Current 15 hours/year when RTO/ISO determines a blackout is imminent.
    - No other operation as part of a financial arrangement with another entity.
  - Proposed Revision
    - Up to 100 hours/year if:
      - Energy Emergency Alert Level 2 is called
      - Voltage/frequency deviation of 5% of standard
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- ### EPA Proposed Changes
- Allowance for Peak Shaving
    - Currently not allowed as part of a financial arrangement with another entity.
  - Proposed Revision
    - For existing RICE at area sources of HAP:
      - Allow 50 of the 100 hours allowed for maintenance, testing, and EDR to be used for non-emergency operation, including peak shaving to provide power to facility or local distribution system.
      - Allowance will end 4/16/17.
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**To Sum it all Up**

- Need to understand the definition of “emergency” and the generator usage.
- Will not be able to peak shave for financial compensation with a Tier 2 package.
- Will not be able to voluntarily provide demand response power with a Tier 2 package.
- Prime and Continuous ratings will still require a Tier 4 factory certified package.

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**EPA Websites & POC's**

- EPA Web page –
- <http://www.epa.gov>
- Recent EPA Presentations
- <http://www.epa.gov/ttn/atw/rice/ricepg.html>
- Roy Crystal, Region 1 RICE Assistance Lead  
Crystal.roy@epa.gov, 617-918-1745
- Melanie King, Air Strategies Group  
King.melanie@epa.gov, 919-541-2469

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**Questions?**

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### Background

- In 2004, the Environmental Protection Agency (EPA) finalized the guidelines introducing Tier 4 emission standards which are to be phased-in over the period of 2008-2015. The Tier 4 standards require that certain emissions (NOx & Particulate Matter) be further reduced by about 90%.
- Tier 4 standards are dramatically more stringent, reducing NOx emissions by up to 90% and PM emissions by up to 50% beyond Tier 3 restrictions – enough so that in some locations, the exhaust coming out of a Tier 4 engine may have less NOx than the air going in.
- The Tier 4 standards are such a dramatic reduction that implementation is divided into two phases: Tier 4 Interim and Tier 4 Final. All products will be Tier 4 Final by the end of 2015.
- Tier 4 Interim began in 2011, and is intended to enable a gradual phase into Tier 4 Final for manufacturers.
- There are many reasons why Tier 4 regulations are complex and challenging...
  1. First, the targets for NOx and PM are very aggressive. By 2014, both will be reduced by about 90 percent from Tier 2 levels.
  2. In addition, regulations vary by engine horsepower. What's acceptable for one engine configuration may be unacceptable for another.
  3. And finally, regulations vary widely depending on where the equipment is being used. The strictest standards are in the United States, Canada, Europe and Japan, while other parts of the world are less regulated.

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### Background

- Affects mobile diesel generator sets in U.S. & Canada
- Affects stationary diesel generator sets in U.S.
- Stationary engines ≥10 liter / cylinder & <30 liter / cylinder must be certified to Marine Tier 2 limits defined in 40 CFR 94 Subpart C.
- Stationary Emergency engines do not need to meet Tier 4 emission standards.
  - Instead can meet alternative emission standards set forth in 40 C.F.R. Part 60, Subpart III.

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### Tier 4 Electric Power

- Electric Power is different.
  - Regulations are **more stringent** for generator sets than other types of “non-road” equipment.
  - There is no widespread regulation to Tier 4 levels outside of N. America.
  - Current Electric Power products will continue for certain applications in N. America.

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### Air Quality Basics

- Emissions Restricted by EPA Standards
  - Carbon Monoxide (CO)
  - Hydrocarbons (HC)
  - Particulate Matter (PM)
  - Oxides of Nitrogen (NOx)
- Federal Regulations (EPA)
  - Establishes the minimum standard for the US
- State Regulations
  - Can be more stringent than Federal Regulations under some circumstances

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### Air Quality Basics

In order to fully understand the regulations, it is important to understand what is being regulated...

Internal combustion engines emit four major types of emissions: Oxides of Nitrogen (NOx), Particulate Matter (PM), Hydrocarbons (HC), and Carbon Monoxide (CO).

-NOx are highly reactive gases that form when fuel is burned at high temperatures with excess air. It is primarily composed of nitric oxide (NO) and nitrogen dioxide (NO2).

-PM is a mixture of solids and liquids that might include soot from incomplete combustion, Soluble Organic Fraction (SOF) from fuel and lubricating oil, and inorganic sulfates, phosphates, and carbonates from lubricating oil additives.

-HC are the result of unburned fuel and lubricating oil. HC are regulated as either Total Hydrocarbon Emissions (THC) or Non-Methane Hydrocarbons (NMHC).

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### What changes with Tier 4?

- Tier 4 calls for such dramatic reductions in emissions that introduction is divided into two phases
  - Interim – focuses primarily on PM reduction for engines ≤900 kW
    - Commenced in 2008 for engines <56 kW
    - Main impact is in 2011 /12 for engines ≥56 kW
    - Up to 90 % PM reduction & up to 50% NOx reduction vs Tier 3
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  - Final – focuses primarily on NOx reduction
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### What changes with Tier 4?

- Emissions standards vary based on the power category
  - Optimum technology varies by power category
- Reliant on introduction of ULSD (<15 ppm)
  - High sulfur content in fuel is incompatible with aftertreatment devices – specifically catalysts
  - Gensets using Tier 4 aftertreatment cannot be sold / operated in territories where ULSD is unavailable
- Engine & aftertreatment must be certified as a complete system




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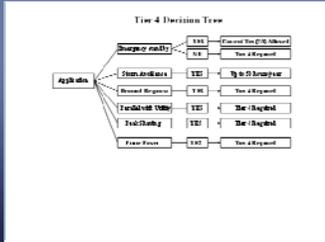
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### Tier 4 Decision Tree






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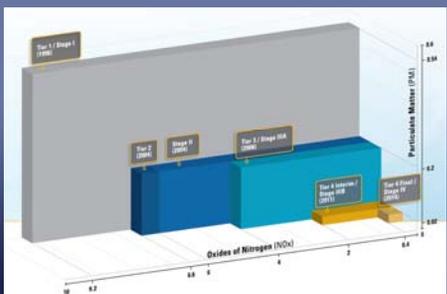
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### Emissions Reduction






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